ABSTRACT OF THE DISCLOSURE

DIRECT SYNTHESIS OF OXIDE NANOSTRUCTURES OF LOW-MELTING METALS

The bulk synthesis of highly crystalline noncatalytic low melting metals such as β-gallium oxide tubes, nanowires, and nanopaintbrushes is accomplished using molten gallium and microwave plasma containing a mixture of monoatomic oxygen and hydrogen. Gallium oxide nanowires were 20-100 nm thick and tens to hundreds of microns long. Transmission electron microscopy (TEM) revealed the nanowires to be highly crystalline and devoid of any structural defects. Results showed that multiple nucleation and growth of gallium oxide nanostructures can occur directly out of molten gallium exposed to appropriate composition of hydrogen and oxygen in the gas phase. These gallium oxide nanostructures are of particular interest for opto-electronic devices and catalytic applications.